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Original Article

Peripherally Inserted Central Catheters (PICC) Lines in Oncology Patients: Patient Satisfaction, Outcomes and Cost Comparison – Experience of an Indian Tertiary Cancer Care Institute

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ABSTRACT

Long term venous access is needed in patients suffering from cancer for administering drugs, chemotherapy, blood collection, transfusions etc. Central venous catheters introduced in the 1980s have been a boon for these patients minimizing their need for repeated trauma. Of the various types of central venous access devices (CVAD's) available, in developing countries like India, some of the limiting factors to decide what type of CVAD is used are the cost involved and the necessary training for the maintenance of the device. Our aim was to review our experience of PICC (Peripherally inserted central catheter) lines over 3 years, to analyze conditions for which PICC lines were used, catheter indwelling period, incidence and types of complications, reasons for removal and quality of life of these patients. We also attempted to compare costs of PICC lines with Chemoport management in our institute. Total 100 patients were followed up for 3 consecutive years, of which 75 were solid tumours and 25 were haematological. The median age was 33 years (Range 2 –77). The average duration of indwelling catheter is ranged 2 days–12 months. PICC line was found to be more cost-effective than Chemoport insertion in the overall scenario. 21% of patients had complications related to the management of PICC lines. The overall quality of life was maintained well with PICC line.
Conclusion: PICC lines in oncology patients are reasonably safe for long lasting CVAD with acceptable incidence of complications. They are also cost effective compared to Chemoports in developing countries.
Keywords: Safe and reliable CVAD, Cost-effective, PICC lines, Acceptable complications, Long lasting.

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INTRODUCTION

Long term venous access is necessary for cancer patients in view of prolonged treatment requiring frequent administration of chemotherapy as well as blood components, antibiotics, and total parenteral nutrition. Central venous catheters introduced in 1980s have minimized the need of venipunctures in these patients thus increasing patient satisfaction. These devices have revolutionized the care and quality of life of cancer patients.

Central venous access devices (CVADs) are of various types including implantable subcutaneous Chemo ports (CPs), peripherally inserted central catheters (PICCs) and tunnelled and non-tunnelled catheters. Deciding factors for the choice of device are patient's age, diagnosis of the patient, frequency and duration of treatment, type of medications used and preference of the patient, and physician involved. Along with the scientific criteria, cost, maintenance and the right training forms a crucial factor in the long term management of these devices in patients suffering from cancer.

We aimed to review our experience of PICC lines over 3 years, to analyze underlying conditions for which PICC lines were used, indwelling period of catheter, the incidence and types of complications, reasons for removal and overall satisfaction of patients. We also attempted to compare costs of PICC lines with Chemoport management in our institute in terms of the insertion and maintenance at our institute.

MATERIALS AND METHODS

In this retrospective, observational study, we studied the clinical profile of 100 patients with PICC line insertion in our institute, placed in patients with haematological malignancies and solid tumours from April 2016 to July 2019.

PICC lines were inserted by an oncology PICC line trained nurse using the Seldinger technique. They were normally placed in the cubital vein of

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the nondominant upper limb. Prior to use, position of catheter was confirmed by a chest radiograph. PICC lines were used not only for the administration of chemotherapy but also for supportive care including antibiotics, blood products, and total parenteral nutrition.

Exclusive criteria included Potential Source of infection, Injury or Trauma/Burn, Severe Bleeding Disorder, Severe Immunocompromised state and Noncompliance.

Protocol for catheter care

Patients have explained the procedure of catheter care. After arranging the PICC tray in a clean area, an antiseptic solution was used to remove the old dressing. The exit site of the catheter was observed for any signs of infection. Exit site cleaned with chlorhexidine gluconate 4% using the surgical technique. Catheter cleaned followed by the outer area. Following all aseptic precautions, the catheter was flushed with heplock and saline. Exit site sprayed with Cavilon and covered with biopatch and tegarderm. Dressing secured. The patient explained about care and maintenance of the catheter.

Catheter removal

Under all Aseptic precautions, removal is done with a pressure dressing. Post removal, the sterile dressing was applied after applying local pressure at the exit point for 5 min. Catheter was examined for thrombosis, breakage and obstruction. Common reasons for catheter removal were the treatment completion, accidental removal, blockages, infection and post mortality.

RESULTS

A total of 100 PICC lines were inserted over 3 years. Of these 75 patients suffered from haematological malignancy. The average age of the patient was 38 years, age ranging from 2- 77 years.

Median Catheter indwelling period

The average indwelling time for PICC line catheter was 3 months in 57 patients, 6 months in 31 patients, 9 months in 7 patients and for around a year in 5 patients. (Range: 2 days – 12 months). 1 patient required removal in 2 days due to a foreign body reaction.

Cost Comparison

The total cost for each patient, i.e the amount spent on insertion of device and regular maintenance was calculated. Cost estimates were calculated in Indian rupees (INRs).

The cost rate of chemo port device is approximate 22,000-25,000 Rs and the cost rate of PICC line is approximate 12,000-15,000 rs. Overall approximate cost of chemoport insertion was around 70,000 and PICC line insertion around 20,000. Though the monthly maintenance of PICC line was found to be more than Chemoport insertion, PICC line still held long term cost benefits. (Table 1).

Reasons for removal of central venous access devices: In this 1 year, 9 PICC lines were removed post mortem, 10 came with accidental removal of tubes and 11 were removed elsewhere. 1 was removed due to venous thrombosis and 2 due to blockage. 3 had febrile neutropenia and needed removal of the PICC lines.

Complications

21% of patients had complications related to the management of PICC lines. 1 had a foreign body reaction, In 2 patients procedure was aborted during insertion due to tortuous veins and needed insertions of necklines. 1 patient had venous thrombosis, 2 had blocked catheter and 5 had PICC line-related infections. 10 patients came with accidental removal of PICC line catheters.

Table 1 : Cost comparison of PORT VS PICC.

General ward estimate			
Cost of port		**Cost of PICC**	
Cost of Device	23000	Cost of Device	15000
OT Charges	36000	OT Charges	0
Consumables	9000	Consumables	2000
Administration and MRD	1300	Administration and MRD	0
Insertion Charges		Insertion Charges	2400
Bed Charges	1600	Bed Charges	0
DR"S Visit	1500	DR"S Visit	0
Radiology Charges	350	Radiology Charges	350
Total Insertion Cost	70750	Insertion Charges	19750
Removal Charges	20000	Removal Charges	150
Care AND Maintainance X MTH	2500	Care and Maintainance X MTH (4 Dressing) Each 2500	10000

Patient satisfaction

A hospital devised an unvalidated questionnaire to assess patient satisfaction was used. (Table 2) Patients were asked about their experience issues and satisfaction with the PICC initially after the 1 week of insertion and then during each subsequent hospital visit.

Statistical analysis

Data were analyzed by SPSS 13 software using descriptive statistics.

DISCUSSION

Central venous catheterization is a time-tested technique of quickly accessing the great veins.[1] As per literature insertion of PICC line has been seen to be more in haematological malignancies.[2] In our study it was seen to be used more for solid tumours (75%) compared to haematological malignancies (25%).

Jain *et al*.[2] in their study, of 213 patients reported catheter indwelling period being more in port patients (280 days) and as compared to PICC patients (59 days). Median indwelling period of PICC in our study was 108 days.

One of the major limitation for the use of a Chemoport in developing countries like India is the cost factor. It is the reason for comparatively less number of Chemoport as compared to PICC lines.[3] In India, a cost comparison analysis between the two groups would be necessary to explain the preference for PICC to CP. In our centre, the overall approximate cost of chemo port insertion was around INR Rs 70,000 and PICC line insertion around INR Rs 20,000. Though the monthly maintenance of PICC line was found to be more than Chemoport insertion, PICC line still held long term cost benefits. In a similar study from an Indian perspective, it was found the average cost of insertion and maintenance of CP was six times that incurred for PICC and was found to be statistically significant ($P < 0.0001$).[3]

In a study by Patel *et al*.[4] the cost of maintenance associated with PICC lines is significantly higher than that for port devices (US $9.22 vs. US $26.36 for ports vs. PICCs). Similarly in our study, the monthly

Table 2: Hospital based Questionnaire for assessment of patient satisfaction.

	Questionnaire for assessment of patient satisfation					
Sl. No	Dominator	1	2	3	4	5
1	Did you feel pain during insertion of catheter			5	25	19
2	Did u get pain during infusion of drug through catheter		1	5	28	20
3	Did you have local discomfort, irritable or heaviness felt when catheter was *in situ*	1	6	17	24	8
4	Whether you eas satisfy during regular visit to the catheter care in ACI for timly care and maintnance		3	17	26	9
5	Whether you have any impact on daily activities (self care, house hold chores/ professional activities)		2	25	21	7
6	Whether you have counselled properly before insertion of PICC		2	10	32	10
7	Did u face any impact or any complication such as financial burdon, ,loss of days of work.		17	18	18	3
8	Overall satisfaction		2	6	32	14

maintenance of PICC lines was 4 times more than the maintenance cost of Chemoports (INR Rs 10,000 vs INR Rs 2500)

Our overall complication rate of 21% over the study period of 3 years. The mechanical complication was 6%, infection-related complications were 5% and surprisingly high rate (10%) of accidental removal of PICC lines. Jain *et al*.[2] had 19% incidence of overall complication. Of these 12% were mechanical and 7% infective. In another study, Kim *et al*.[5] had 30.1% overall complication incidence with 18.3% mechanical and 12.8% infective. As per literature overall complication rates range up to 15%, with mechanical complications reported in 5-19% of patients,[6-8] infectious complications in 5-26%, and thrombotic complications in 2-26%.[1]

A study by a tertiary care cancer institute in south India had reported accidental dislodgement as the most common mechanical complication during the catheter indwelling period (10.19%)[3] similar to our study which showed accidental removal of PICC lines to be 10%.

The rates of Catheter-related bloodstream infections (CRBSI) vary from as low as 7%,[2] to as high as 60%[5] across different studies. Gorelick *et al*.[9] reported 27% incidence of infection in those who were neutropenic at the time of catheter insertion. In our study CRBSI was 5%. 45% of catheters were removed after completion of therapy suggesting that most of the PICC lines served the purpose they were meant for.

The limitation of this study is that the questionnaire to assess patient satisfaction was hospital devised and not validated.

CONCLUSION

PICC lines in oncology patients are reasonably safe for long lasting CVAD with acceptable incidence of complications. They are also cost effective compared to Chemoports in developing countries like India.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

PICC lines: Peripherally inserted central catheter lines; **CVAD:** Central Venous access Devices, **CRBSI:** Catheter-related bloodstream infections.

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